

Sub C2

WHAT IS CLAIMED IS:

1. A semiconductor device, comprising:
a semiconductor substrate; and
a conductive layer formed on said semiconductor substrate and
including polycrystals, said conductive layer including in its surface a
recess caused by a crystal grain boundary and having side walls formed
such that a distance therebetween becomes small as closer to said
semiconductor substrate.
2. The semiconductor device according to claim 1, wherein said
conductive layer includes:
a first conductive layer formed on said semiconductor substrate and
including a polycrystal having a first average grain size; and
5 a second conductive layer formed on said first conductive layer,
including a polycrystal having a second average grain size greater than
said first average grain size and having said recess.
3. The semiconductor device according to claim 1, further
comprising a thin film layer formed on said conductive layer and having a
material different from that of said conductive layer.
4. The semiconductor device according to claim 1, wherein said
conductive layer includes aluminum.
5. The semiconductor device according to claim 1, further
comprising an insulating layer formed on said semiconductor substrate and
a barrier layer formed on said insulating layer, said conductive layer being
formed on said barrier layer.
6. A semiconductor device, comprising:
a first conductive layer formed on a semiconductor substrate and
including a polycrystal having a first average grain size;

5 a second conductive layer formed on said first conductive layer and
including a polycrystal having a second average grain size greater than
said first average grain size; and

 a third conductive layer formed on said second conductive layer and
including a polycrystal having a third average grain size smaller than said
second average grain size.

7. The semiconductor device according to claim 6, wherein a recess
is formed in a surface of said second conductive layer by a crystal grain
boundary, and a distance between side walls of said recess becomes small
as closer to said semiconductor substrate.

8. The semiconductor device according to claim 6, further
comprising a thin film layer formed on said third conductive layer and
having a material different from that said third conductive layer.

9. The semiconductor device according to claim 6, wherein said
conductive layer includes aluminum.

10. The semiconductor device according to claim 6, further
comprising an insulating layer formed on said semiconductor substrate and
a barrier layer formed on said insulating layer, said conductive layer being
formed on said barrier layer.

11. A method of manufacturing a semiconductor device, comprising
the steps of:

5 forming a conductive layer including a polycrystal on a
semiconductor substrate, said conductive layer having a recess in its
surface formed by a crystal grain boundary, a distance between side walls
of said recess becoming large as closer to said semiconductor substrate; and
processing said side walls of said recess such that the distance
therebetween becomes small as closer to said semiconductor substrate.

12. The method of manufacturing the semiconductor device according to claim 11, wherein said step of forming said conductive layer includes the steps of:

5 forming a first conductive layer on said semiconductor substrate at a first temperature; and

forming a second conductive layer having said recess on said first conductive layer at a second temperature higher than said first temperature.

13. The method of manufacturing the semiconductor device according to claim 11, further comprising the step of forming a thin film layer having a material different from that of said conductive layer on said conductive layer having the processed side walls.

5 14. The method of manufacturing the semiconductor device according to claim 11, further comprising the step of forming an insulating layer on said semiconductor substrate and the step of forming a barrier layer on said insulating layer, said step of forming said conductive layer including the step of forming said conductive layer on said barrier layer.

15. The method of manufacturing the semiconductor device according to claim 11, wherein said step of processing said side walls includes the step of sputter etching said conductive layer.

16. A method of manufacturing a semiconductor device, comprising the steps of:

5 forming a first conductive layer on a semiconductor substrate at a first temperature;

forming a second conductive layer on said first conductive layer at a second temperature higher than said first temperature; and

forming a third conductive layer on said second conductive layer at a third temperature lower than said second temperature.

17. The method of manufacturing the semiconductor device according to claim 16, wherein said step of forming said second conductive layer includes the step of forming said second conductive layer with a recess formed in its surface by a crystal grain boundary and having side walls, a distance between said side walls becoming large as closer to said semiconductor substrate, said method further comprising the step of processing said side walls such that a distance therebetween becomes small as closer to said semiconductor substrate, and wherein

10 said step of forming said third conductive layer includes the step of forming said third conductive layer on said second conductive layer having said processed side walls.

18. The method of manufacturing the semiconductor device according to claim 16, wherein said step of processing said side walls further includes the step of sputter etching said conductive layer.

19. The method of manufacturing the semiconductor device according to claim 16, further comprising the step of forming a thin film layer having a material different from that of said third conductive layer on said third conductive layer.

20. The method of manufacturing the semiconductor device according to claim 16, further comprising the step of forming an insulating layer on said semiconductor substrate and the step of forming a barrier layer on said insulating layer, said step of forming said conductive layer including the step of forming said conductive layer on said barrier layer.